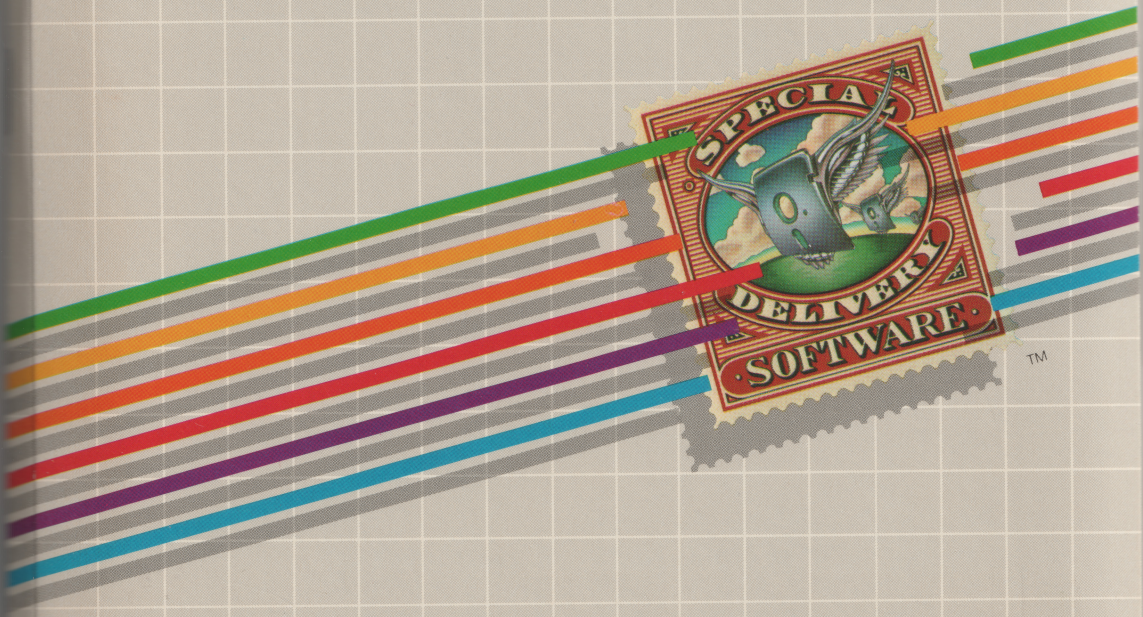
A P P L E



TM

MATH STRATEGY

by

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INTRODUCTION

The Math Strategy program will help make learning basic mathematics fun and easy. This program is based on the most current and exciting research on how people learn and what the best ways are to learn. This research has shown that people move their eyes to specific positions when they are thinking and learning. For instance, when someone is picturing something in his or her mind's eye, their eyes will move up and to the left or up and to the right:

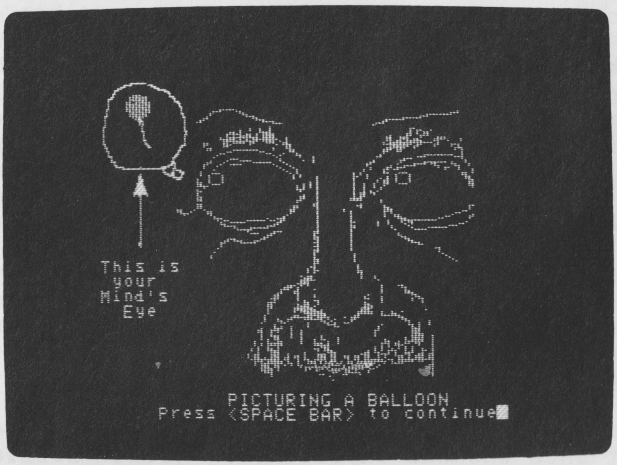


FIGURE 1—PICTURING A BALLOON IN YOUR MIND'S EYE

This research also demonstrates that moving your eyes to the right places can actually improve your abilities to think and learn clearly.

Math Strategy will teach you how to use visualizing in your mind's eye as a strategy for learning to memorize basic math equations correctly and quickly by moving your eyes and making mental pictures.

CHAPTER I

FINDING YOUR MIND'S EYE

The most important skills of a good mathematician are the STORAGE and RECOGNITION of correct equations and formulas. This, of course, is the emphasis of the Math Strategy program.

This is accomplished by storing and recalling a visual image of the correct equation in your mind's eye. Before beginning with the program, then, it will be important for you to familiarize yourself with your mind's eye. Knowing how and when to use this important faculty can help tremendously with many tasks and improve your abilities dramatically.

A famous mathematician, who had a reputation for being able to add tremendous columns of numbers in his head, was once asked how he was able to accomplish such intellectual feats. In reply, the mathematician claimed that "HE" really didn't do anything. "When someone gives me the numbers," he said, "I just make a picture of them on a blackboard in my mind's eye and wait awhile. Pretty soon a hand appears and writes the answer on the board."

Because he knew how to use his mind's eye, the mathematician was able to greatly streamline the process of addition. Research shows that training and using the mind's eye greatly helps in basic multiplication and division, too.

One of the developers of Math Strategy had a young client once who was experiencing great difficulties in his basic scholastic skills. He was particularly poor at spelling and elementary arithmetic. To check the young man's visual capabilities the author asked him if he had ever seen the movie 'Star Wars.' The boy's face lit up as he exclaimed that he indeed had seen the movie! He was then asked if he could look in his mind's eye and see the Wookie, a character in the movie. The boy's eyes shifted up and left and he began describing the Wookie. He could describe everything that the Wookie did in great detail, even though he had only seen the movie once!

Once the boy had located his mind's eye by using the image of the Wookie he was asked to watch the Wookie open his mouth and hear the funny growling sound he made, and as he did so to see the letters "W-O-O-K-I-E" printed out on the screen over his mouth. Not so surprisingly, the boy could do this easily.

From then on he was directed to see all his spelling words and multiplication tables printed over the Wookie's mouth in this fashion. Whenever he wanted to spell a word or remember an equation, after that, he could simply look up at his "magic movie screen", and the Wookie would show him the answer! From that point on the young man consistently got high scores on his spelling and math tests.

Results like this are commonplace when you understand the strategy for HOW something is done. By incorporating the natural access to the process of visualization and including an element of positive motivation the boy's ability to spell and memorize came easily. That is why the Math Strategy program was organized and designed with the popular computer game type format in mind. We feel that this is important in that the use of color and sound as reinforcement and motivation for correct math more fully use the capabilities of the computer as opposed to simply simulating a blackboard or textbook.

You can find your own mind's eye by performing a simple visual task like trying to remember which way Lincoln is facing on the penny or by visualizing a familiar image like the Mona Lisa and paying attention to your accessing cues. If you are experiencing difficulty in visualizing there is no need to worry about it. Remember that this program was designed to help build just that skill. As you run the Math Program just look in the direction that the computer shows you and go through a few lessons and you will probably notice improvement in your ability to visualize already.

CHAPTER II

SETTING UP

To run this program you will need an Apple II with Applesoft in ROM (or a RAM card) or an Apple II+, with at least 48K of memory and DOS 3.3. Although it is not necessary, a color TV or color monitor is highly recommended, as the programs make extensive use of color.

To get started all you need to do is insert the Math Strategy disk in your disk drive, turn on your Apple, and follow the instructions the computer gives you. Before starting it is best to place your TV or monitor above eye level and to the left (if you are right-handed) or to the right (if you are left-handed) as shown in Figure 2.

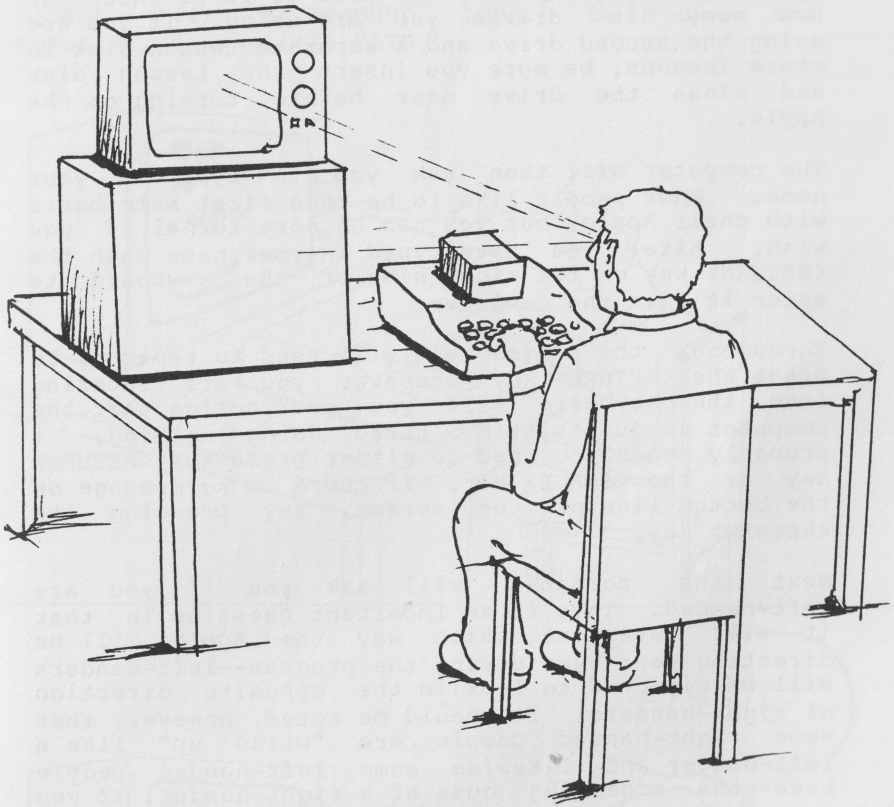


FIGURE 2—PREFERRED EQUIPMENT SETUP

This will insure the most effective use of the eye position accessing cues to be utilized in this program. If it is difficult or is not possible for you to place your TV or monitor in that position then be sure you move your eyes past the screen to the upper left- (or right-) hand corner of your visual field when the computer points out the direction.

After showing you the Behavioral Engineering logo, the first thing the computer will do is to check for how many disk drives you are using. If you are using the second drive and a separate Lesson disk to store lessons, be sure you insert the Lesson disk and close the drive door before turning on the Apple.

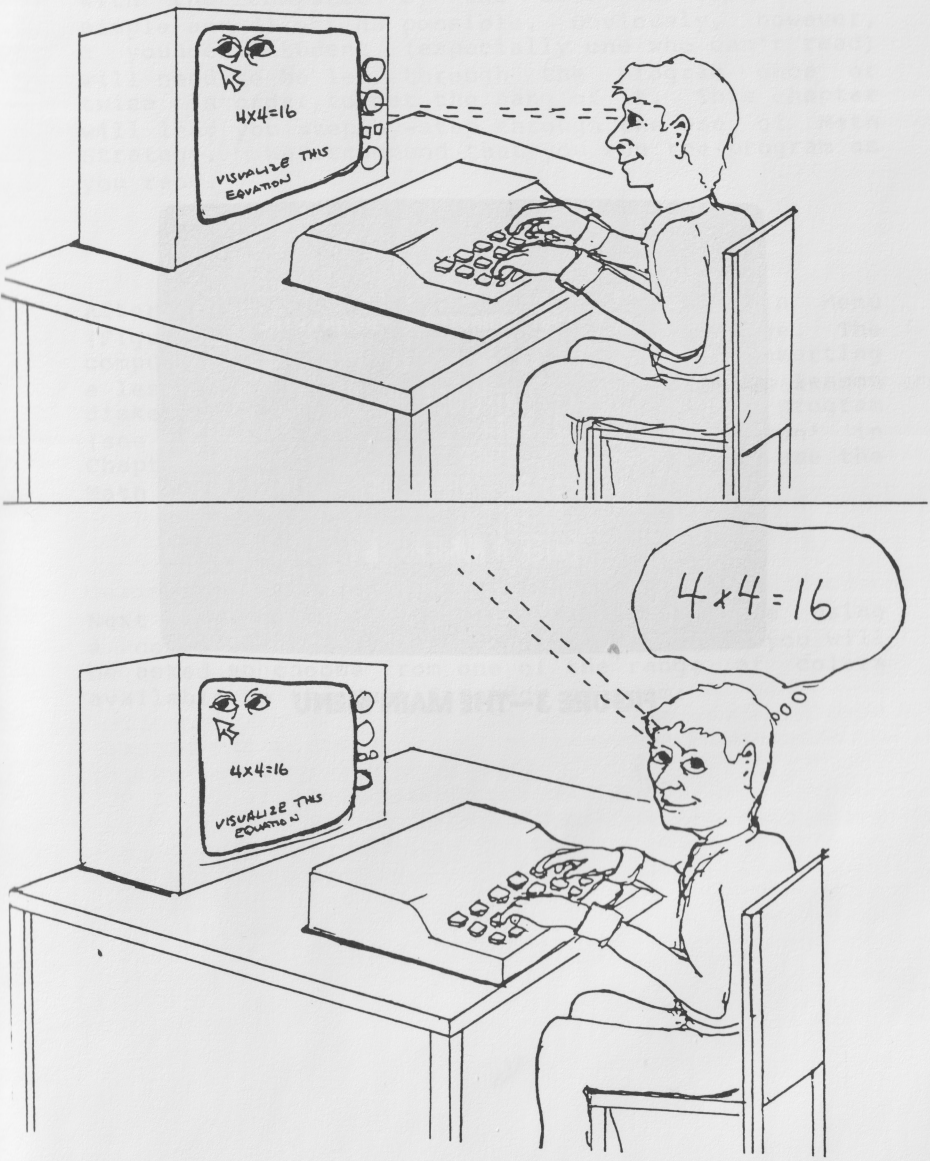
The computer will then ask you to type in your name. Most people like to be on a first name basis with their Apple, but you can be more formal if you wish. After you have typed in your name push the <RETURN> key on the right side of the keyboard to enter it into the computer.

Throughout the program you will need to remember to press the <RETURN> key whenever you are entering from the keyboard. If you ever notice that the computer is just sitting there doing nothing, it probably means you need to either press the <RETURN> key or the <SPACE> bar. If there is no message on the bottom line of the screen, try pressing the <RETURN> key.

Next the computer will ask you if you are left-handed. This is an important question in that it will determine which way the Apple will be directing your eyes during the program--left-handers will be directed to look in the opposite direction of right-handers. It should be noted, however, that some right-handed people are "wired up" like a left-hander and likewise some left-handed people have the accessing cues of a right-hander. If you seem to be having difficulty visualizing the equations being presented to you during the program you should try answering this question opposite of the way you normally would and see if it helps you get a clearer remembered image.

When the Main Menu (Figure 3) appears select '<1> INTRODUCTION' first. This will introduce you and familiarize you with the meaning and significance of various eye movements and help you to locate your mind's eye.

If you are interested in more information about eye movements or Neuro-Linguistic Programming you may select '<4> BACKGROUND INFO.' To resume the Tutorial, choose '<2> MATH.'



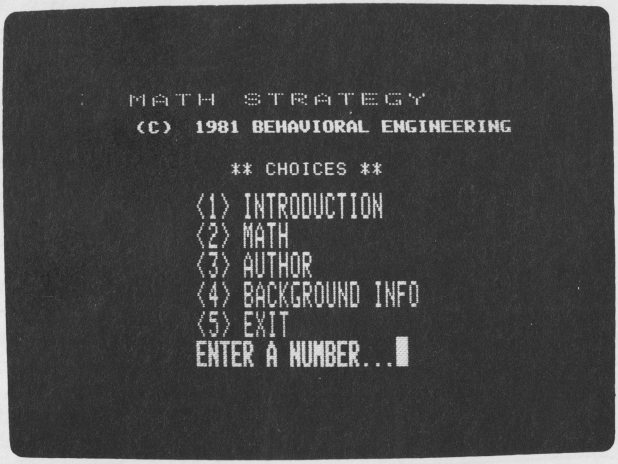


FIGURE 3—THE MAIN MENU

CHAPTER III

TUTORIAL

Math Strategy was designed for use by young children (4 - 5 years old) as well as adults. Interaction with the computer by the user has been kept as simple and direct as possible. Obviously, however, a younger student (especially one who can't read) will need to be led through the program once or twice in order to get the hang of it. This chapter will lead you step-by-step through the use of Math Strategy. We recommend that you run the program as you read.

RUNNING A LESSON

After selecting '<2> MATH' from the Main Menu (Figure 3) you will be shown the title page. The computer will later give you the option of inserting a lesson diskette. You may make up your own lesson diskettes using the authoring option in the program (see the section on 'Creating A New Lesson' in Chapter IV). For this Tutorial, you will use the Math Strategy disk.

CHOICE OF COLOR

Next you will be asked whether or not you are using a color TV or monitor. If you have color you will be asked to choose from one of the range of colors available to the Math Strategy program:

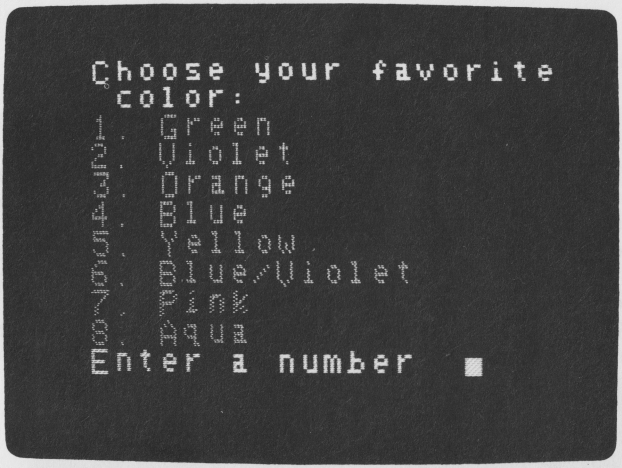


FIGURE 4—CHOICE OF COLOR

If you are using a black and white TV or monitor the color with the most distinctive contrast will be selected for you by the computer.

One important aspect of being good at basic math is being able to tell whether the image you see in your mind's eye is actually the correct picture of the equation. To help you with this process Math Strategy has you choose a particular color and then presents the correct equation (and ONLY the correct equation) in that color. The correct equation, then, is color-coded for you in YOUR favorite color! Whenever you want to know the correct formulation of an equation, that you are not sure about, you can simply choose the one you see in your favorite color in your mind's eye.

Once you have indicated your favorite color, the computer will then ask if you want to learn at the level of:

<1> BEGINNING
OR
<2> INTERMEDIATE MATHEMATICIAN

The primary difference between choosing to be a Beginning or Intermediate Mathematician, is the type of feedback you are given if you misenter the equation you are learning. If a Beginning Mathematician misenters the equation, the correct equation will be immediately displayed directly above the misentered one so a comparison may be made by the student.

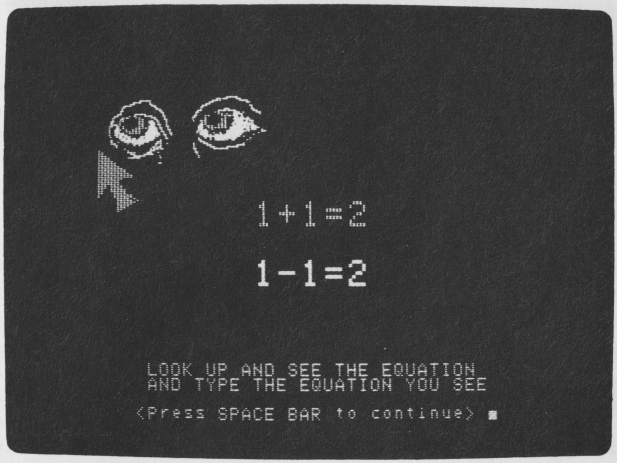


FIGURE 5—FEEDBACK FOR BEGINNERS

If the Intermediate mathematician misenters the equation, the screen will simply be cleared and s/he will be asked to enter the equation again. If the student misenters the equation three times in a row the computer will show the student the correct equation again.

You will then be asked whether or not you want the sound effects that accompany the feedback and reinforcement portions of the program. This choice will allow you to either keep the computer quiet while you are learning or activate the game-style noises that have been built into the program.

The next prompt on your screen will ask you to insert a Lesson disk and, if you have two disk drives, select which drive will have the lessons.

There are four sample lessons on the Math Strategy disk, so it is not necessary that you remove it to run one of them. But if you are planning to create a library of lessons for yourself, your family, or your students, you will want to use fresh diskettes that can be copied and backed up. For information on initializing and copying diskettes, see the DOS 3.3 Manual. Lessons are created with the AUTHOR function of Math Strategy (see Chapter IV for details).

If this is your first time running the program, we recommend that you leave the Math Strategy disk in the drive and run a sample lesson that is already provided for you. Just press the <SPACE> bar when asked to insert a Lesson disk.

The next thing you will see is a listing of the lesson files on the diskette. If you are using the Math Strategy disk you will be given the following choices:

1) ADDITION
2) SUBTRACTION
3) MULTIPLICATION
4) DIVISION

Just type in the number of the lesson you want to run and press the <RETURN> key.

After you have made the preceding choices, you will be given the following important instructions:

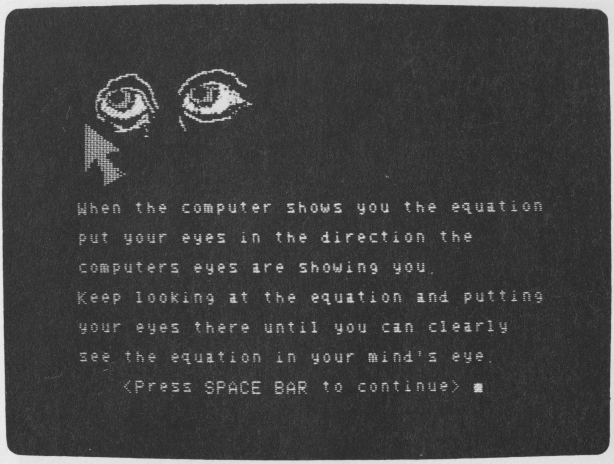


FIGURE 6—VISUALIZATION INSTRUCTIONS

In this way the computer will be using the naturally occurring accessing cues of the student and instructing him or her as to HOW to employ the most effective strategy for basic math.

If the student can follow these simple instructions the process of learning basic math skills will become as simple and easy as it is for the worlds best mathematicians. These instructions, of course, will need to be read and explained to younger children who cannot yet read.

VISUALIZING THE EQUATION

The computer will print out the first equation in the lesson in the color you have chosen. It will then ask you to look up and visualize that equation.

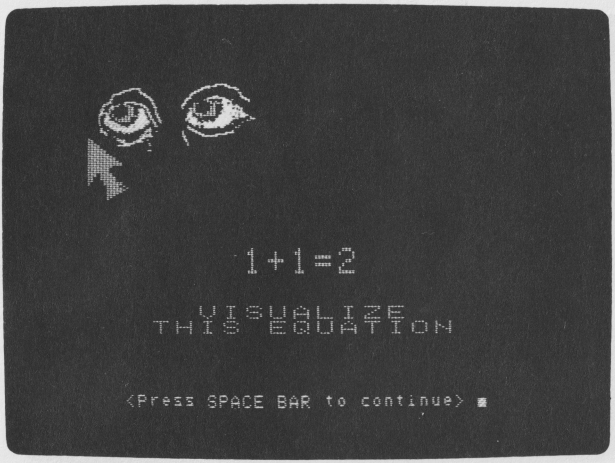


FIGURE 8—VISUALIZING THE EQUATION

You should look at the equation and then move your eyes in the direction indicated by the arrow and the eyes on the computer screen. The object is not to actually focus on the ceiling or the wall (when people are visualizing, their eyes tend to defocus, in fact) but rather to simply place your eyes there as you picture the numbers in your mind's eye. This is shown in Figure 9:

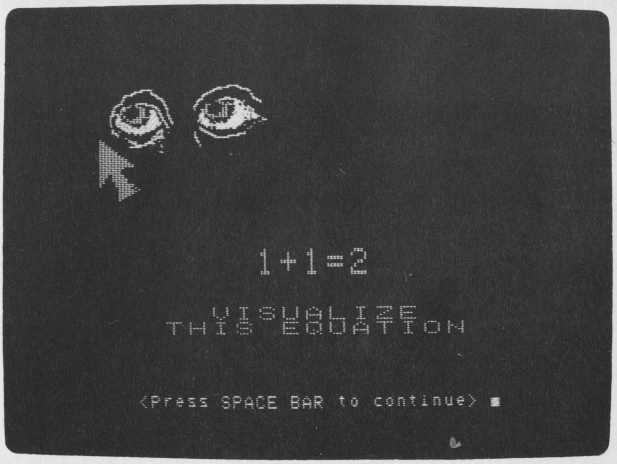


FIGURE 9—HOW TO USE ACCESSING CUES

Once you have clearly represented the image of the equation in your mind and have pressed the <SPACE BAR> the computer will ask you to look up to the image you have made and stored and simply copy down the sequence of symbols that you see by typing it into the computer. It is not necessary to say them to yourself--this can slow you down. Simply remember what the equation looks like and copy it (it almost seems delightfully like cheating to those who have never visualized before).

If you make a typo or notice an error in your math when you are entering the equation you can simply press the left-arrow key, '<-', to go back one character and type over it. Notice how the equation is printed out in white only when you first enter it. This to insure that mistakes do not appear in your favorite color and interfere with the color coding effect.

We have included two special functions in the program: to prevent students from getting stuck and frustrated on a particular equation, the program is set up so that if the <RETURN> key is depressed first, when the computer is asking for a equation, the computer will automatically shift on to the next equation or portion of the lesson. (You cannot use the <RETURN> key when prompted to press the <SPACE> bar.) The other special function allows the user to restart the Program by entering an <ESC> at any time the program is requesting input. This will terminate the lesson and allow the user to choose another one or go back to the Main Menu.

Incidently, because young children can coordinate the activity of pushing buttons before they can coordinate the ability to write, children can learn math on a computer BEFORE they learn to write. Computer math, then, can accelerate the education of children who use it.

As we pointed out earlier, feedback for misentered sequences is given based on the choices that were made as a Beginning or Intermediate Mathematician.

ENTERING THE EQUATION BACKWARDS

After you have typed in the correct sequence of numbers once, the computer asks you to input the sequence BACKWARDS! This is done to insure that your representation of the equation is actually a visual image. Keep in mind that the Math Strategy is concerned only for your ability to recall a particular visual image and not your 'understanding' of mathematics. If the equation you are visualizing, then, is '6x3=18' the computer will not accept '3x6 = 18' as the right answer - even though it is mathematically correct. If you do input an equation like the example we just gave, the computer would inform you that your answer was mathematically correct but not the answer requested.

The process of entering the equation backwards is used to reinforce the strategy of pure visualization. When you are LOOKING at an equation it is just as easy to read the numbers off from right to left as it is from left to right. Saying the equation backwards (especially a longer one like '538x66=35508') is a different matter. Many people actually have an easier time remembering the equations backwards because it reduces the interference from their auditory representational system.

If you make any typos or other errors, simply use the forward arrow, '->', to backtrack and type over them. (Don't forget the <RETURN> key if you get tired). The computer will continue having you enter the equations forwards and backwards until you have gone through all of the equations in the lesson.

CHOOSING FROM A LIST OF EQUATIONS

Once you have completed this section of the program and demonstrated that you have the equations stored visually the computer will take you through a portion of the program designed to insure that you can use your stored image to RECOGNIZE the correct formulation of the equation.

First, the computer will print out a set of equations consisting of possible formulations of the first equation of the lesson. The correct equation is included, of course, as one of your choices.

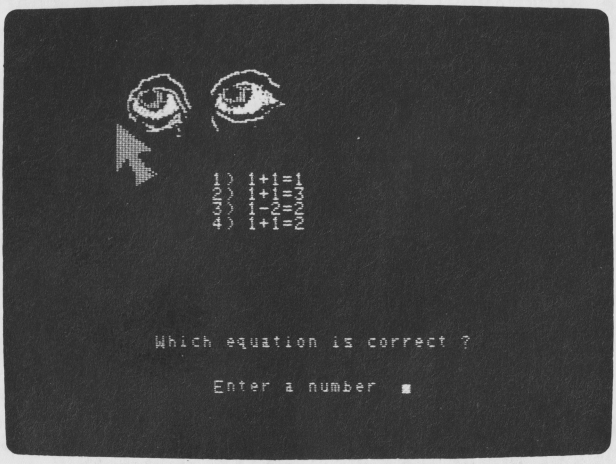


FIGURE 10—EQUATION SELECTION

Your task is to look at the various equations, then look up and enter the number of the equation that matches the one you have stored in your favorite color in your mind's eye.

Notice that if you enter the number of an incorrect equation the order of the equations will be rejumbled (to make sure the correct equation cannot be discovered by process of elimination) and you will be asked to choose again. If you are an intermediate mathematician and misenter three times you will be given the opportunity to see the correct equation in your favorite color. If you are a beginner you will be prompted with the correct equation after each mistake. Again, you may also use the <RETURN> key if you want to move on to the next equation or portion in the program.

FILL IN EQUATION

The final portion of the lesson involves the completion of a 'fill in' equation as a test for visual recall. The computer will print out part of the equation and you required to fill in the missing number(s).

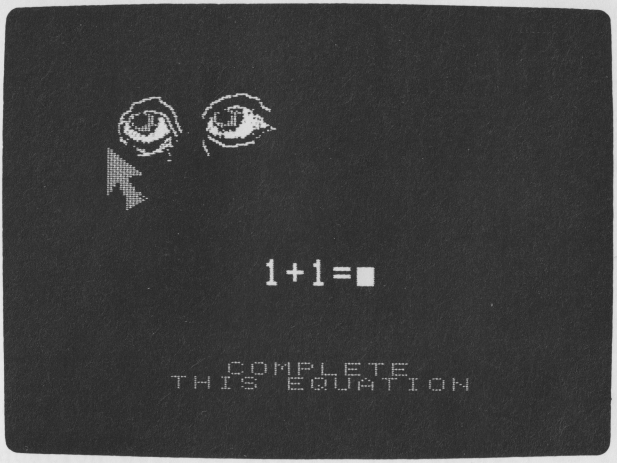


FIGURE 11—FILL IN EQUATION

If you miss on your guess the first part of the equation will be repeated and you can try again. If you miss three times and you are an intermediate mathematician you will be shown the correct equation. Otherwise you will be prompted with the correct equation after each mistake. As always, you can use the <RETURN> key alone to move on to the next word or portion of the program.

At the conclusion of the lesson you will be returned to the Main Menu. You may run another Lesson (or re-run the same one) by choosing '<2> MATH' again. You will not be asked to insert a Lesson disk unless you have removed it, nor will you be prompted for color, sound, etc. To change them, select '<5> EXIT' from the Main Menu with the Math Strategy disk in drive one.

CHAPTER IV

AUTHOR

Math Strategy is provided with the necessary tools to create your own lessons for yourself, your children, or your students. If you wish to create a Lesson disk, be sure to have one or more 'INIT'ed disks ready when you begin (see your DOS 3.3 Manual for instructions).

CREATING A LESSON

When you return to the Main Menu this time choose option '<3> AUTHOR.' You will then see the Author Menu:

<1> CREATE A LESSON
<2> DELETE A LESSON

One of the most important features of the Math Strategy program is the ability to create your own lessons. With this feature you may tailor lessons to the equations and math problems that are most relevant for you, your students, or your family to learn.

Each lesson may consist of up to twelve equations--and you can fit as many as forty lessons on a disk.

First you will be asked to name the lesson you want to create. Then you will be instructed to enter the correct equation you wish to include in the lesson. If you enter a <RETURN> as the first character, you will terminate the lesson. At this point the computer will not accept a formulation that is incorrect. That is, if you type in '2+3=6' for the correct formulation, the computer will make you reenter the equation. You will then be asked to type in some misformulations of the equation. You may include up to eight incorrect formulations. you should have AT LEAST ONE incorrect equation.

While it is asking for incorrect equations, the computer will not accept one that is mathematically correct.

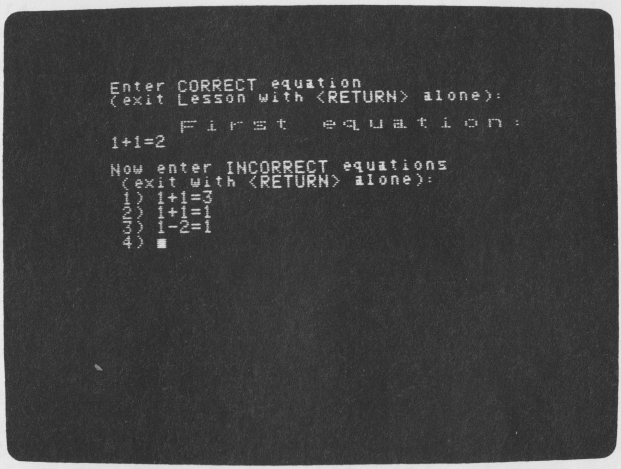


FIGURE 12—CREATING A LESSON

The equation will be printed out exactly as it looks when you type it in, so make sure you get it the way you want it to appear to the student.

When you are ready to conclude your lesson just press the <RETURN> key alone when the computer asks you for the next correct equation.

As we already pointed out you may put up to twelve equations on a lesson--or it may be only one equation long. The computer will keep asking you to enter more equations until you press <RETURN> when asked for a correct equation or the number of equations reaches twelve.

When you are done creating the lesson, the computer will automatically save the Lesson on your lesson disk for you. The lesson will appear in the Index, under the name you have given it, the next time you run a lesson.

DELETING A LESSON

By choosing option <2> on the Author Menu you may delete lessons that you no longer need. All you need to do is to enter the number of the lesson you want to delete. After verifying with you that you really do want to delete the lesson, the computer will do the rest. DO NOT DELETE THE LESSONS SUPPLIED ON THE MATH STRATEGY DISKETTE!! You cannot delete lessons on a disk which is write-protected (see your DOS 3.3 Manual for details).

EXITING

When you have once again returned to the Main Menu and are ready to quit the program, either turn your Apple off or take out the Math Strategy disk and insert a new one and select '<5> EXIT' on the Main Menu. If you do not remove the Math Strategy diskette, pressing '5' will simply start you all over again, allowing new choices for name, color, and handedness for a new user.

CHAPTER V

IF SOMETHING GOES WRONG

This disk is copy protected and the programs are copyrighted, so please don't try to copy them. You may move lesson files using the FID program on the Apple System Master Diskette, but you must be VERY careful to move the file 'MATH.INDEX' and ALL the Lesson files on that disk TOGETHER.

Although every effort has been made to provide you with a mistake-proof program, certain errors can still occur. While you can expect error-free operation when using the program according to these instructions, you might make a mistake or use a damaged diskette.

Most errors will be automatically taken care of by the program, but there are a few exceptions. If the program ever does anything unusual, check this section before proceeding.

TYPES OF ERRORS

There are two types of errors that can occur during the operation of these programs. The first type of error can be caused by pressing the <RESET> key at the top of the Apple keyboard, or by the entry of the character 'Control-C' (that is, holding down the <CTRL> key and pressing the <C> key). If you enter the 'Control-C' character it will restart the program. Pressing <RESET> will take you back to the Main Menu. This may require that you reinsert the Math Strategy disk to rerun the programs if you have removed it to run a lesson. If you have forgotten to change the diskette the computer will remind you. The second type of error involves the disk, and can occur for a number of reasons. If you leave the disk drive door open or if the disk is write-protected the program will take the appropriate action and instruct you if needed. For these types of errors the program will describe the problem and resume operation as soon as the error has been resolved.

APPENDIX A

HOW AND WHY THIS PROGRAM WORKS

Math Strategy is an interactive, self-paced computer program that is engineered to teach people of all ages to do simple math correctly in a way that is effective, time efficient and enjoyable.

The Math Strategy program is unique among current educational software in that its emphasis is on HOW to do simple mathematics rather than just on WHAT exercises to do.

The principles used in the Math Strategy program are drawn from current developments and discoveries in the field of Neuro-Linguistic Programming--a discipline which combines psychology and neuro-physiology into a powerful practical behavioral model for learning and communication.

Neuro-Linguistic Programming (NLP) is a model of how the brain functions and the impact that it has on our behavior. NLP has been applied with dramatic results in such diverse fields as therapy, business and education. Neuro-Linguistic Programming stresses the fact that human beings organize their experience through their sensory representational systems: VISUAL (sight), AUDITORY (hearing), KINESTHETIC (feelings), GUSTATORY (taste) and OLFACTORY (smell). 'Thinking', 'remembering,' 'imagining,' or 'learning' all are a function of connecting, combining, accessing or storing sensory representations in our brains.

One of the most interesting and important discoveries of NLP is the observation that as people tune into, focus on or get in touch with a particular representational system they exhibit systematic and observable behaviors, called 'accessing cues' in NLP. One such observable sensory cueing mechanism is eye movement. Observation and research show that the average right-handed person will consistently demonstrate the following pattern:

EYE POSITION REPRESENTATIONAL SYSTEM ACCESSED

up and left ------Visual remembered (Vr)
up and right -----Visual constructed (Vc)
straight left ----Auditory remembered (Ar)
straight right ---Auditory constructed (Ac)
down left --------Auditory internal dialogue (Ad)
down right -------Kinesthetics (K)

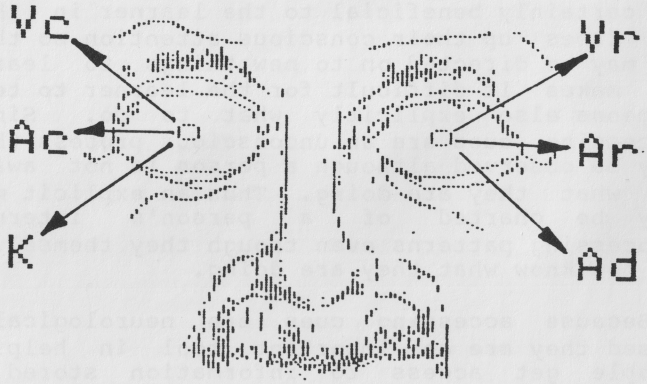


FIGURE 13—ACCESSING CUES

NOTE: Some people have eye movement cues that are laterally reversed--notably, the majority of left-handed people. Their eye movement cues are the opposite of those shown above. That is, they look up and right to remember visual images (Vr), and look up left to construct visual imagery (Vc) and so on.)

A short introductory program has been provided for you on the disk, called BACKGROUND INFORMATION, that will help to further acquaint you with eye movements as sensory accessing cues.

The discovery of accessing cues and what they represent has an important impact for the field of education in two ways:

1. It is a well known (and bemoaned) fact that the people who have learned to do something the most completely and effectively are typically not conscious of HOW they are doing it. In fact the degree to which one can do something without being conscious of what one is doing is most often the primary indicator of how well one has learned it. Although this phenomenon is certainly beneficial to the learner in that it frees up their conscious attention so that it may be directed on to new things to learn, it makes it difficult for the learner to tell someone else explicitly what to do. Since accessing cues are an unconscious process they may be observed although a person is not aware of what they are doing. Thus an explicit map may be charted of a person's internal processing patterns even though they themselves do not know what they are doing.

2. Because accessing cues are neurologically based they are an important tool in helping people get access to information stored in their sensory systems. The accessing position a person is in plays a critical part in helping to trigger the information they are seeking. A person who is looking down and right (accessing feelings) and saying that he cannot SEE his way out of the mess he is in, for instance, may be assisted in doing so by having his eyes directed up and left or up and right. By paying attention to one's accessing cues, then, our typically unconscious learning strategies may be modelled and taught. Through observation of accessing cues and by explicit questioning it can be easily observed that good mathematicians visualize the numbers and equations they are working with just as good spellers visualize clearly the words they are spelling. Teaching people to visualize words and to employ the proper accessing cues when they are spelling has been shown to dramatically improve their spelling abilities - even those who have been labelled 'dislexic' and 'learning disabled.' Similarly, people who have exceptional capabilities in math

consistently store the basic multiplication, division, addition and subtraction tables as visual images. A person who is good with numbers will use stored visual images of the equations as opposed to constantly having to add, subtract, multiply or divide in 'longhand.'

APPENDIX B

REFERENCE BOOKS ON NEURO-LINGUISTIC PROGRAMMING

The following books contain information relating to NLP:

FROGS INTO PRINCES, Bandler, R., and Grinder, J.
NEURO-LINGUISTIC PROGRAMMING VOLUME I, Dilts, R., Grinder, J., Bandler, R., et al
THE STRUCTURE OF MAGIC VOLUMES I & II, Bandler, R., and Grinder, J.
THEY LIVED HAPPILY EVER AFTER, Cameron-Bandler, L.
THERAPUTIC METAPHORS, Gordon, D.

These books are available through:

Meta Publications
P.O. Box 565
Cupertino, CA 95014

With the exception of FROGS INTO PRINCES, which is available from:

Real People Press
Box F.
Moab, Utah 84532

We hope you enjoy and learn from your use of this program. It is only one in a series of exciting and effective learning programs made possible by the behavioral technology of Neuro-Linguistic Programming.

For more information on our seminars for:

Reading
Composition
Math
Second Language Aquisition
Management Skills
Sales Skills
and NLP Basics

Please contact:

Behavioral Engineering
230 Mount Hermon Road #207
Scotts Valley, Calif. 95066

APPENDIX C

APPLE SYSTEM REQUIREMENTS

The following is a list of equipment you will need to use the Math Strategy disk on your Apple II:

* an Apple II with 48K memory and Applesoft OR
* an Apple II+ with 48K memory
* one or two Apple Disk II with 16-sector PROMS
* a video monitor or TV - color is preferred

For reference, you should have on hand a copy of the following manuals:

* this manual
* Apple II Reference Manual
* Apple II BASIC Programming Manual
* Apple II DOS 3.3 Manual

You do not need to read all the manuals but they should be on hand to answer questions that may arise in operating the equipment. All the information you will need to operate the Math Strategy programs is contained in this manual or is in the programs.

Set up your Apple II system according to the instructions in the BASIC Tutorial. No game paddles are required for these programs. If you have a Disk Operating System that runs 13-sectors (DOS 3.2.1 or earlier), you will have to upgrade your Controller to 16-sector DOS 3.3. Consult your Apple dealer for the required parts. Any version of DOS earlier than 3.2.1 will have to be upgraded to run these programs. Refer to Chapter II, SETTING UP, in this manual.

#030-0352-A



MATH STRATEGY

C2E0010 MASTER

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apple computer inc.

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